Homework #23
Math 211

Problems for Section 7.4

Find the integrals in Exercises 1–14.

1. $\int te^{5t}\,dt$

3. $\int (z+1)e^{2z}\,dz$

5. $\int x^3 \ln x\,dx$

7. $\int y\sqrt{y+3}\,dy$

9. $\int \frac{z}{e^z}\,dz$

11. $\int \frac{y}{\sqrt{5-y}}\,dy$

Evaluate the integrals in Problems 17–20 both exactly [e.g. $\ln(3\pi)$] and numerically [e.g. $\ln(3\pi) \approx 2.243$].

17. $\int_1^5 \ln t\,dt$

19. $\int_1^3 t \ln t\,dt$

Problems for Section 6.3

7. A recently-installed machine earns the company revenue at a continuous rate of $60{,}000t + 45{,}000$ dollars per year during the first six months of operation and at the continuous rate of 75,000 dollars per year after the first six months. The cost of the machine is \$150,000, the interest rate is 7% per year, compounded continuously, and t is time in years since the machine was installed.

   (a) Find the present value of the revenue earned by the machine during the first year of operation.
   (b) Find how long it will take for the machine to pay for itself; that is, how long it will take for the present value of the revenue to equal the cost of the machine?

Solutions

Section 7.4

1 $\frac{1}{5}te^{5t} - \frac{1}{25}e^{5t} + C$

3 $(1/4)(2z+1)e^{2z} + C$

5 $(x^4/4)\ln x - (x^4/16) + C$

7 $(2/3)y(y+3)^{3/2} - (4/15)(y+3)^{5/2} + C$

9 $-(z+1)e^{-z} + C$

11 $-2y(5-y)^{1/2} - (4/3)(5-y)^{3/2} + C$

13 $-t\cos t + \sin t + C$

15 $\frac{1}{5}t^2e^{5t} - \frac{2}{25}te^{5t} + \frac{2}{125}e^{5t} + C$

17 $5\ln 5 - 4 \approx 4.047$

19 $(9/2)\ln 3 - 2 \approx 2.944$

21 (a) Substitution
(b) Substitution
(c) Substitution
(d) Substitution
(e) Parts
(f) Parts

23 $1 - 3e^{-2}$

25 $4\ln 4 - 3\ln 3 - 1$

27 45.71 (ng/ml)-hours

29 Integrate by parts choosing $u = x^n$, $v' = e^x$

Section 6.3

1 Future value = \$72,980.16
Present value = \$29,671.52

3 (a) P = \$47,216.32
F = \$77,846.55
(b) \$60,000; \$17,846.55

5 (a) (i) \$18,846.59
(ii) \$16,484.00
(b) (i) \$21,249.47
(ii) \$24,591.24

7 (a) \$65,022
(b) $\approx$ 2.27 years

9 (a) \$417,635.11
(b) \$228,174.64

11 \$41,508

13 (a) \$4.6 billion; \$8.6 billion
(b) \$54.7 billion
(c) \$77.6 billion

15 About 1.75 years

17 In 10 years